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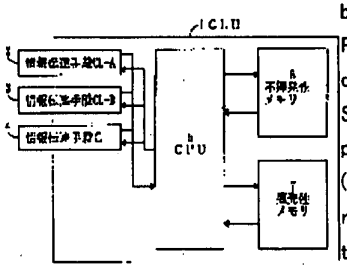
(54) PORTABLE INFORMATION PROCESSOR



(57)Abstract:

PROBLEM TO BE SOLVED: To verify the hardware and software of an RWU and a CLU by establishing communication between the RWU and the CLU even during the development of the RWU and the CLU.

SOLUTION: This portable information processor (1) is provided with at least means (2, 3, 4) which transmit information through a radio wave between reader/writer devices so that identification information is included as a part of transmission data, and that the data is transmitted. This processor (1) is also provided with a function which transmits fixed identification information as the identification information.

LEGAL STATUS

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CLAIMS

[Claim(s)]

[Claim 1] The portable information processor characterized by having the function which sends out the identification information of immobilization as said identification information in the portable information processor which is equipped with a means to transmit information through an electric wave between reader/writer equipment at least, is made to contain identification information as some transmit data, and transmits data.

[Claim 2] The portable information processor characterized by the ability to set up the mode of operation which does not compare the identification information returned from reader/writer equipment with the sent-out identification information in the portable information processor which is equipped with a means to transmit information through an electric wave between reader/writer equipment at least, is made to contain identification information as some transmit data, and transmits data.

[Claim 3] The portable information processor characterized by the ability to set up the mode of operation which does not check the adjustment of the check code for transmission error detection in the portable information processor which is equipped with a means to transmit information through an electric wave between reader/writer equipment at least, is made to contain identification information as some transmit data, and transmits data.

[Claim 4] The portable information processor characterized by the ability to set up the mode of operation which does not check coincidence/inequality of an authorization code in the portable information processor which is equipped with a means to transmit information through an electric wave between reader/writer equipment at least, is made to contain identification information as some transmit data, and transmits data.

[Claim 5] Claims 1 and 2, the portable information processor given in 4 either which are characterized by the ability to set up the mode of operation which does not check the adjustment of the check code for transmission error detection.

[Claim 6] 3 is [claim 1 which can set up the mode of operation which does not check coincidence/inequality of an authorization code thru/or] the portable information processor of a publication either.

[Claim 7] The portable information processor according to claim 1 or 2 which can set up the mode of operation which does not check the adjustment of the check code for transmission error detection, and the mode of operation which does not check coincidence/inequality of an authorization code.

[Translation done.]

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3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention is activated using an electromagnetic-induction phenomenon, and relates to portable information processors, such as an IC card which can also perform subsequent actuation and information interchange with reading / write-in equipment using an electric wave.

[0002]

[Description of the Prior Art] Conventionally, a non-contact portable information processor (contact loess unit: CLU) is activated by the electric wave transmitted from write-in reading / equipment (reader/writer unit: RWU) side, and what performs information interchange using an electric wave is proposed. The case where drawing 6 (a) has one CLU in the range which the subcarrier from RWU reaches is shown, and drawing 6 (b) shows the case where two or more CLU(s) (CLU1, CLU2) exist in the

range which the subcarrier from RWU reaches. Thus, when performing information interchange with RWU and CLU using an electric wave, exchange of the individual information (CID:Chip ID) which specifies CLU as the range which the subcarrier from RWU reaches between RWU and CLU supposing two or more CLU(s) existing is made. CID is a value based on the serial number of CLU, or is a random number generated each time.

[0003] Delivery and RWU return CID to RWU as a part whose CLU is transmit data, and return CID to CLU as some transmit data. CLU continues a communication link, only when returned CID is in agreement with its own CID. Only when received data and a check code are in agreement, processing is continued, and in the case of an inequality, he becomes a no response, and is trying to add the check code for detecting a transmission error to each other transmitted and received data, and to wait for the next reception in CLU.

[0004] Drawing 7 explains the example (example of a data format) of a check code added to transmission data. The example which added the code (BCC) which drawing 7 (a) makes several bytes of data a lump, and makes this the count range and carries out a block check is shown. While the example which added the bit (CC) which performs a parity check per cutting tool of data is shown and drawing 7 (c) adds the bit (CC) which performs a parity check per cutting tool of data, drawing 7 (b) The example which added the code (BCC) which makes several bytes of data 1 block, makes this the count range and carries out a block check, and added the bit (CC) which performs the parity check of BCC further is shown. Such a check code is added and it is carrying out whether processing is continued and whether it becomes a no response by whether received data and a check code were in agreement in CLU.

[0005] Next, drawing 8 - drawing 10 explain the conventional example of a communication link in the case of being the case where CLU is one, and two to RWU. In addition, in drawing, the transmission direction shows by the arrow head whether the either data of RWU and CLU are transmitted. By the case where CLU is one, drawing 8 shows the example to which the communication link is carried out normally to RWU. Since a call command is transmitted from RWU (step 1-1) and CLU is outside the electric-wave range (step 1-2), a call command is again transmitted from RWU (step 1-3). From CLU, CID is transmitted as some data, it answers (step 1-4), and RWU is returning CID to CLU as some transmit data to this (step 1-5). Since returned CID of CLU corresponds with its own CID, it answers (step 1-6), and a communication link is continued henceforth (step 1-7). This example is a case as RWU has the data pattern of immobilization by case [like the data pattern of immobilization] whose CID is.

[0006] By the case where CLU is one, drawing 9 shows the example to which the communication link is not carried out normally to RWU. Since a call command is transmitted from RWU (step 2-1) and CLU is outside the electric-wave range (step 2-2), a call command is again transmitted from RWU (step 2-3). From CLU, CID is transmitted as some data, it answers (step 2-4), and RWU is returning a different CID to CLU as some transmit data to this (step 2-5). Since returned CID of CLU does not correspond with its own CID, it becomes a no response (step 2-6). Since this example is a case as CLU generates CID based on a random number and RWU still has only the data pattern of immobilization that it is under [development] sake etc. and cannot transmit from RWU CID transmitted from CLU, CLU which received this becomes a no response, therefore RWU cannot grasp whether CLU is in what kind of situation.

[0007] Drawing 10 shows the example of a communication link in case CLU is two to RWU. Since a call command is transmitted from RWU (step 3-1) and CLU is outside the electric-wave range (step 3-2), a call command is again transmitted from RWU (step 3-3). On the other hand, from CLU1 and CLU2, CID1 and CID2 are transmitted as some data, respectively, and it answers (step 3-4). Since two or more CLU(s) answered, RWU transmits a CLU discernment command (step 3-5). It is the command urged for this discernment command to specify two or more time amount partitions, and to answer to some timing, and in this example, CLU1 answers first, CID1 is transmitted as some data, and CLU2 is a no response (step 3-6). Furthermore, a CLU discernment command is transmitted from RWU (step 3-7), since CLU1 has already answered, a no response and CLU2 answer and it transmits CID2 as some data (step 3-8). On the other hand, the card select command containing RWU to CID2 is transmitted (step 3-9), a no response and CLU2 have answered (step 3-10), and, as for CLU1, a communication link is continued henceforth (step 3-11). In this example, RWU is highly efficient and it is the example which has the capacity to return the same CID as CID which made it generate based on a random number from CLU.

[0008]

[Problem(s) to be Solved by the Invention] When performing information interchange with RWU and CLU using an electric wave, originally it is an ideal that CID of CLU is a different value from the thing of other CLU(s). However, RWU and CLU are developing and some data (here CID) which CLU transmitted are embedded as some transmit data from RWU. In the situation which cannot calculate dynamically the check code for detecting the transmission error of the situation which cannot perform dynamic actuation of returning to CLU anew, or data, either the communication link of RWU

and CLU -- it cannot continue -- development of RWU and CLU, the check of software of operation, etc. -- trouble ****** -- it becomes things.

[0009] This invention is for solving the above-mentioned technical problem, and the communication link between RWU and CLU is established during development of RWUCLU, and it aims at enabling it to perform verification of the hardware of RWU and CLU, and software smoothly.

[0010]

[Means for Solving the Problem] In the portable information processor which this invention is equipped with a means to transmit information through an electric wave between reader/writer equipment at least, is made to contain identification information as some transmit data, and transmits data Having the function which sends out the identification information of immobilization as said identification information, the mode of operation which does not compare the identification information returned from reader/writer equipment with the sent-out identification information, It is characterized by the ability of the mode of operation which does not check the adjustment of the check code for transmission error detection, and the mode of operation which does not check coincidence/inequality of an authorization code to set each up.

[0011]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained. Drawing 1 is drawing showing the example of a configuration of CLU to which this invention is applied. CLU1 has the means 2-4 of signal transduction for exchanging information between RWU(s) as shown in drawing 6 . The means 2 and 3 of signal transduction are means to transmit information through an electric wave, and the modulation techniques of an electric wave differ mutually. The means 4 of signal transduction expresses the contact terminal, and is a means to realize signal transduction of a contact process. CPU5 is an arithmetic unit which interprets and executes the command from RWU transmitted through the means of signal transduction (for example, read/write), and performs the response to RWU. Nonvolatile memory 6 is storage with which data, such as control information and software, are stored. Volatile memory 7 is storage which offers the working area at the time of CPU calculating.

[0012] Drawing 2 is drawing showing some contents of the nonvolatile memory which OS of CLU manages. CLU1 of this invention is sent out with reference to the fixed value CID set up, if the fixed value CID is set as nonvolatile memory 6 and the call command from RWU is received. RWU stores the data pattern of the immobilization about CID, and it is chosen from the data pattern of immobilization of the fixed value CID returned from CLU, it returns it, and, as a result, the communication link between both is performed. You may make it send out "the value given fixed beforehand, for example, "00h", FFh", etc. from CLU to the call command from RWU besides this. In addition, it enables it to perform the mode of whether to use as a CID the fixed value CID or the value given fixed by setting effective / invalid flag as nonvolatile memory.

[0013] In addition, communicating is possible if the mode of operation "which does not compare CID returned from RWU" is prepared, though CID is generated based on a random number. For example, as shown in drawing 2 , CID collating effective / invalid flag is set up, and the flag which repeals collating is built. By setting up a flag effectively, it can consider as the mode which compares CID. Moreover, if the mode of operation "which does not check the adjustment of the check code for transmission error detection" is prepared, communicating, even if there is a transmission error is possible. For example, as shown in drawing 2 , transmission error check effective / invalid flag is set up, and the flag which repeals collating is built. By setting up a flag effectively, it can consider as the mode in which transmission error checking is performed. Moreover, if the mode of operation "does not check coincidence/inequality" in the check of coincidence/inequality of the authorization code which applied cryptographic algorithm is prepared, communicating, even if authentication is not materialized is possible. For example, as shown in drawing 2 , authentication check effective / invalid flag is set up, and the flag which repeals collating is built. By setting up a flag effectively, it can consider as the mode in which an authentication check is performed. In addition, the mode which uses the fixed value CID, the mode of operation which does not compare CID, the mode of operation which does not check the adjustment of the check code for transmission error detection, and the mode in which coincidence/inequality of an authorization code are not checked may be used independently, or you may make it combine some of these modes or all the modes.

[0014] Drawing 3 shows the example of a communication link set as the mode of operation which does not compare CID returned from RWU. Since a call command is transmitted from RWU (step 4-1) and CLU is outside the electric-wave range (step 4-2), a call command is again transmitted from RWU (step 4-3). From CLU, CID which made it generate as some data based on a random number is transmitted, and it answers (step 4-4). On the other hand, RWU returns a different CID to CLU as some transmit data (step 4-5), and without CLU performing the comparison with returned CID at this time, coincidence/inequality ignores and answers (step 4-6), and

continues a communication link henceforth (step 4-7).

[0015] Drawing 4 shows the example of a communication link to which CLU sends out the fixed value CID. Since a call command is transmitted from RWU (step 5-1) and CLU is outside the electric-wave range (step 5-2), a call command is again transmitted from RWU (step 5-3). From CLU, the fixed value CID is transmitted as some data, and it answers (step 5-4). On the other hand, RWU is preparing the data pattern of the immobilization about CID, the same CID as the fixed value CID transmitted out of this is returned to CLU as some transmit data (step 5-5), and CLU performs the comparison with returned CID, since it is in agreement, it answers (step 5-6), and it continues a communication link henceforth (step 5-7).

[0016] Drawing 5 is drawing showing the flow of the processing of CLU in the communication link of this invention, and processing of RWU. If a command is transmitted from RWU (step S1), CLU will receive this, and will interpret and execute a command (steps S2 and S3), and it will judge whether it is the mode in which CID of immobilization is transmitted (step S4). In the mode in which CID of immobilization is not transmitted, data including the fixed value CID are transmitted in the mode in which transmit the data containing CID which made it generate based on a random number for example (step S5), and CID of immobilization is transmitted (step S6). If it receives the response from CLU (step S7), the expected value (data pattern of the immobilization about CID which RWU is preparing) of immobilization is compared with CID of a response, and RWU will transmit a command including the fixed value CID, when in agreement (step S9). The processing at the time of an inequality (step S10), for example, an error, is outputted at the time of an inequality. If a command including the fixed value CID from RWU is received (step S11), CLU will judge whether it is the mode in which CID is checked (step S12), Reception CID will be compared with Transmission CID at the time of the mode to check (step S13), and it will become a no response at the time of an inequality (step S14). The time of the mode in which CID is not checked at step S12, and when in agreement, at step S13, a command is processed and a response is transmitted (steps S15 and S16). RWU will continue a communication link henceforth, if a response is received from CLU (step S17).

[0017] In addition, grasp (distance) being regarded as questionable in many cases and tuning RWU finely, CLU has secured grasp with CLU, prepares a thing like a static test mode for RWU, and may be made to carry out an easy transmitting test at this time. It may be made to perform this static test mode by any of the special control with the software and the host computer incorporating RWU.

[0018]

[Effect of the Invention] Since a non-contact modulation and the check of a demodulator circuit of operation are attained, and this invention only changes the setting bit on nonvolatile memory after manufacturing CLU and these functions are made as for it to effective/invalid, it becomes easy to establish the communication link between RWU and CLU, and it comes to be able to make smooth verification of the hardware of RWU and CLU, and software in RWU under development, and CLU. Moreover, if a thing like a static test mode is prepared for RWU, it will also become possible to carry out an easy transmitting test. In this way, also in the condition that RWU is provided only with the function for a communication link test (low function), since this invention can make a communication link possible, it can offer a leading means to check not the check of the fault of software but actuation of hardware.

[Translation done.]

TECHNICAL FIELD

[Field of the Invention] This invention is activated using an electromagnetic-induction phenomenon, and relates to portable information processors, such as an IC card which can also perform subsequent actuation and information interchange with reading / write-in equipment using an electric wave.

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PRIOR ART

[Description of the Prior Art] Conventionally, a non-contact portable information processor (contact loess unit: CLU) is activated by the electric wave transmitted from write-in reading / equipment (reader/writer unit: RWU) side, and what performs information interchange using an electric wave is proposed. The case where drawing 6 (a) has one CLU in the range which the subcarrier from RWU reaches is shown, and drawing 6 (b) shows the case where two or more CLU(s) (CLU1, CLU2) exist in the range which the subcarrier from RWU reaches. Thus, when performing information interchange with RWU and CLU using an electric wave, exchange of the individual information (CID:Chip ID) which specifies CLU as the range which the subcarrier from RWU reaches between RWU and CLU supposing two or more CLU(s) existing is made. CID is a value based on the serial number of CLU, or is a random number generated each time.

[0003] Delivery and RWU return CID to RWU as a part whose CLU is transmit data, and return CID to CLU as some transmit data. CLU continues a communication link, only when returned CID is in agreement with its own CID. Only when received data and a check code are in agreement, processing is continued, and in the case of an inequality, he becomes a no response, and is trying to add the check code for detecting a transmission error to each other transmitted and received data, and to wait for the next reception in CLU.

[0004] Drawing 7 explains the example (example of a data format) of a check code added to transmission data. The example which added the code (BCC) which drawing 7 (a) makes several bytes of data a lump, and makes this the count range and carries out a block check is shown. While the example which added the bit (CC) which performs a parity check per cutting tool of data is shown and drawing 7 (c) adds the bit (CC) which performs a parity check per cutting tool of data, drawing 7 (b) The example which added the code (BCC) which makes several bytes of data 1 block, makes this the count range and carries out a block check, and added the bit (CC) which performs the parity check of BCC further is shown. Such a check code is added and it is carrying out whether processing is continued and whether it becomes a no response by whether received data and a check code were in agreement in CLU.

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[0007] Drawing 10 shows the example of a communication link in case CLU is two to RWU. Since a call command is transmitted from RWU (step 3-1) and CLU is outside the electric-wave range (step 3-2), a call command is again transmitted from RWU (step 3-3). On the other hand, from CLU1 and CLU2, CID1 and CID2 are transmitted as some data, respectively, and it answers (step 3-4). Since two or more CLU(s) answered, RWU transmits a CLU discernment command (step 3-5). It is the command urged for this discernment command to specify two or more time amount partitions,

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EFFECT OF THE INVENTION

[Effect of the Invention] Since a non-contact modulation and the check of a demodulator circuit of operation are attained, and this invention only changes the setting bit on nonvolatile memory after manufacturing CLU and these functions are made as for it to effective/invalid, it becomes easy to establish the communication link between RWU and CLU, and it comes to be able to make smooth verification of the hardware of RWU and CLU, and software in RWU under development, and CLU. Moreover, if a thing like a static test mode is prepared for RWU, it will also become possible to carry out an easy transmitting test. In this way, also in the condition that RWU is provided only with the function for a communication link test (low function), since this invention can make a communication link possible, it can offer a leading means to check not the check of the fault of software but actuation of hardware.

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[0009] This invention is for solving the above-mentioned technical problem, and the communication link between RWU and CLU is established during development of RWUCLU, and it aims at enabling it to perform verification of the hardware of RWU and CLU, and software smoothly.

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MEANS

[Means for Solving the Problem] In the portable information processor which this invention is equipped with a means to transmit information through an electric wave between reader/writer equipment at least, is made to contain identification information as some transmit data, and transmits data Having the function which sends out the identification information of immobilization as said identification information, the mode of operation which does not compare the identification information returned from reader/writer equipment with the sent-out identification information, It is characterized by the ability of the mode of operation which does not check the adjustment of the check code for transmission error detection, and the mode of operation which does not check coincidence/inequality of an authorization code to set each up.

[0011]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained. Drawing 1 is drawing showing the example of a configuration of CLU to which this invention is applied. CLU1 has the means 2-4 of signal transduction for exchanging information between RWU(s) as shown in drawing 6 . The means 2 and 3 of signal transduction are means to transmit information through an electric wave, and the modulation techniques of an electric wave differ mutually. The means 4 of signal transduction expresses the contact terminal, and is a means to realize signal transduction of a contact process. CPU5 is an arithmetic unit which interprets and executes the command from RWU transmitted through the means of signal transduction (for example, read/write), and performs the response to RWU. Nonvolatile memory 6 is storage with which data, such as control information and software, are stored. Volatile memory 7 is storage which offers the working area at the time of CPU calculating.

[0012] Drawing 2 is drawing showing some contents of the nonvolatile memory which OS of CLU manages. CLU1 of this invention is sent out with reference to the fixed value CID set up, if the fixed value CID is set as nonvolatile memory 6 and the call command from RWU is received. RWU stores the data pattern of the immobilization about CID, and it is chosen from the data pattern of immobilization of the fixed value CID returned from CLU, it returns it, and, as a result, the communication link between both is performed. You may make it send out "the value given fixed beforehand, for example, "00h", FFh", etc. from CLU to the call command from RWU besides this. In addition, it enables it to perform the mode of whether to use as a CID the fixed value CID or the value given fixed by setting effective / invalid flag as nonvolatile memory.

[0013] In addition, communicating is possible if the mode of operation "which does not compare CID returned from RWU" is prepared, though CID is generated based on a random number. For example, as shown in drawing 2 , CID collating effective / invalid flag is set up, and the flag which repeals collating is built. By setting up a flag effectively, it can consider as the mode which compares CID. Moreover, if the mode of operation "which does not check the adjustment of the check code for transmission error detection" is prepared, communicating, even if there is a transmission error is possible. For example, as shown in drawing 2 , transmission error check effective / invalid flag is set up, and the flag which repeals collating is built. By setting up a flag effectively, it can consider as the mode in which transmission error checking is performed. Moreover, if the mode of operation "does not check coincidence/inequality" in the check of coincidence/inequality of the authorization code which applied cryptographic algorithm is prepared, communicating, even if authentication is not materialized is possible. For example, as shown in drawing 2 , authentication check effective / invalid flag is set up, and the flag which repeals collating is built. By setting up a flag effectively, it can consider as the mode in which an authentication check is performed. In addition, the mode which uses the fixed value CID, the mode of operation which does not compare CID, the mode of operation which does not check the adjustment of the check code for transmission error detection, and the mode in which coincidence/inequality of an authorization code are not checked may be used independently, or you may make it combine some of these modes or all the modes.

[0014] Drawing 3 shows the example of a communication link set as the mode of operation which does not compare CID returned from RWU. Since a call command is transmitted from RWU (step 4-1) and CLU is outside the electric-wave range (step 4-2), a call command is again transmitted from RWU (step 4-3). From CLU, CID which

made it generate as some data based on a random number is transmitted, and it answers (step 4-4). On the other hand, RWU returns a different CID to CLU as some transmit data (step 4-5), and without CLU performing the comparison with returned CID at this time, coincidence/inequality ignores and answers (step 4-6), and continues a communication link henceforth (step 4-7).

[0015] Drawing 4 shows the example of a communication link to which CLU sends out the fixed value CID. Since a call command is transmitted from RWU (step 5-1) and CLU is outside the electric-wave range (step 5-2), a call command is again transmitted from RWU (step 5-3). From CLU, the fixed value CID is transmitted as some data, and it answers (step 5-4). On the other hand, RWU is preparing the data pattern of the immobilization about CID, the same CID as the fixed value CID transmitted out of this is returned to CLU as some transmit data (step 5-5), and CLU performs the comparison with returned CID, since it is in agreement, it answers (step 5-6), and it continues a communication link henceforth (step 5-7).

[0016] Drawing 5 is drawing showing the flow of the processing of CLU in the communication link of this invention, and processing of RWU. If a command is transmitted from RWU (step S1), CLU will receive this, and will interpret and execute a command (steps S2 and S3), and it will judge whether it is the mode in which CID of immobilization is transmitted (step S4). In the mode in which CID of immobilization is not transmitted, data including the fixed value CID are transmitted in the mode in which transmit the data containing CID which made it generate based on a random number for example (step S5), and CID of immobilization is transmitted (step S6). If it receives the response from CLU (step S7), the expected value (data pattern of the immobilization about CID which RWU is preparing) of immobilization is compared with CID of a response, and RWU will transmit a command including the fixed value CID, when in agreement (step S9). The processing at the time of an inequality (step S10), for example, an error, is outputted at the time of an inequality. If a command including the fixed value CID from RWU is received (step S11), CLU will judge whether it is the mode in which CID is checked (step S12), Reception CID will be compared with Transmission CID at the time of the mode to check (step S13), and it will become a no response at the time of an inequality (step S14). The time of the mode in which CID is not checked at step S12, and when in agreement, at step S13, a command is processed and a response is transmitted (steps S15 and S16). RWU will continue a communication link henceforth, if a response is received from CLU (step S17).

[0017] In addition, grasp (distance) being regarded as questionable in many cases and tuning RWU finely, CLU has secured grasp with CLU, prepares a thing like a static test mode for RWU, and may be made to carry out an easy transmitting test at this time. It may be made to perform this static test mode by any of the special control with the software and the host computer incorporating RWU.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is drawing showing the example of a configuration of CLU to which this invention is applied.

[Drawing 2] It is drawing showing some contents of the nonvolatile memory which OS manages.

[Drawing 3] It is drawing showing the example of a communication link set as the mode of operation which does not compare CID returned from RWU.

[Drawing 4] CLU is drawing showing the example of a communication link which sends out the fixed value CID.

[Drawing 5] It is drawing showing the flow of the processing of CLU in the communication link of this invention, and processing of RWU.

[Drawing 6] It is the explanatory view which performs information interchange of RWU and CLU using an electric wave.

[Drawing 7] It is drawing showing the example of a check code added to transmission data.

[Drawing 8] CLU is one and it is drawing showing the example to which the communication link was carried out normally.

[Drawing 9] CLU is one and it is drawing showing the example to which a communication link is not carried out normally.

[Drawing 10] It is drawing showing the example of a communication link in case CLU is two.

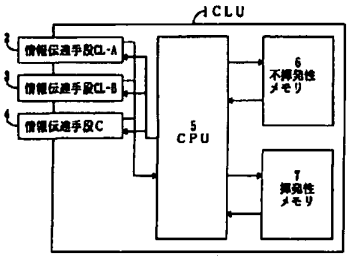
[Description of Notations]

1 [-- CPU, 6 / -- Nonvolatile memory, 7 / -- Volatile memory.] -- 2 CLU, 3 -- The means, 4 which transmit information through an electric wave -- The means of signal transduction of a contact process, 5

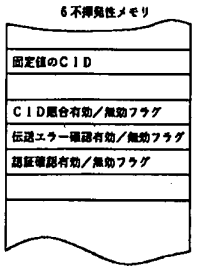
[Translation done.]

DRAWINGS

[Drawing 1]



[Drawing 2]



[Drawing 3]

ステップ	RWU	伝送方向	CLU
4-1	呼出しコマンド	⟶	
4-2			電波範囲外
4-3	呼出しコマンド	⟶	
4-4		⟵	応答(CID)
4-5	カード選択コマンド（異なるCID）	⟶	
4-6		⟵	応答
4-7		.....	

[Drawing 4]

ステップ	RWU	伝送方向	CLU
5-1	呼出しコマンド	⟶	
5-2			電波範囲外
5-3	呼出しコマンド	⟶	
5-4		⟵	応答(CID固定値)
5-5	カード選択コマンド(CID)	⟶	
5-6		⟵	応答
5-7		.....	

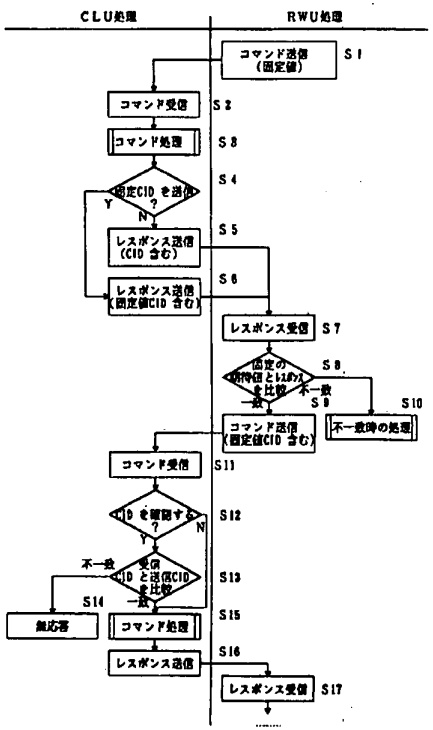
[Drawing 8]

ステップ	RWU	伝送方向	CLU
1-1	呼出しコマンド	⟶	
1-2			電波範囲外
1-3	呼出しコマンド	⟶	
1-4		⟵	応答(CID)
1-5	カード選択コマンド(CID)	⟶	
1-6		⟵	応答
1-7		.....	

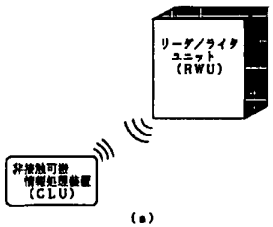
[Drawing 9]

ステップ	RWU	伝送方向	CLU
S-1	呼出しコマンド	⟶	
S-2			電波範囲外
S-3	呼出しコマンド	⟶	
S-4		⟵	応答(CID)
S-5	カード選択コマンド(異なるCID)	⟶	
S-6		⟵	無応答
S-7		·····	

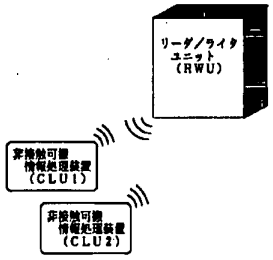
[Drawing 5]



[Drawing 6]

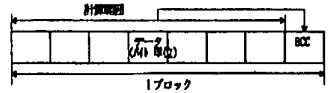


(a)

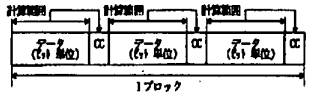


(b)

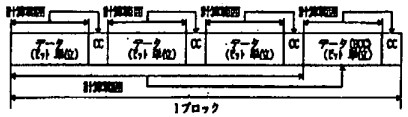
[Drawing 7]



(a)



(b)



(c)

[Drawing 10]

ステップ	RWU	伝送方向	CLU
3-1	呼出しコマンド	⟶	
3-2			電波範囲外
3-3	呼出しコマンド	⟶	
3-4		⟵	応答(CID1, CLI1) 応答(CID2, CLI2)
3-5	CLI 選択コマンド	⟶	
3-6		⟵	応答(CID1, CLI1) 無応答(CLI2)
3-7	CLI 選択コマンド	⟶	
3-8		⟵	無応答(CLI1) 応答(CID2, CLI2)
3-9	ホールド 選択 コマンド(CID2)	⟶	
3-10		⟵	無応答(CLI1) 応答(CLI2)
3-11		.....	

[Translation done.]

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17/00		Ｈ０４Ｂ　5/02		５Ｂ０３５
Ｇ０８Ｃ　17/00		Ｇ０６Ｋ　19/00	Ｎ	５Ｂ０５８
Ｈ０４Ｂ　5/02		Ｇ０８Ｃ　17/00	Ｚ	５Ｋ０１２

審査請求　未請求　請求項の数７　ＯＬ　（全７頁）

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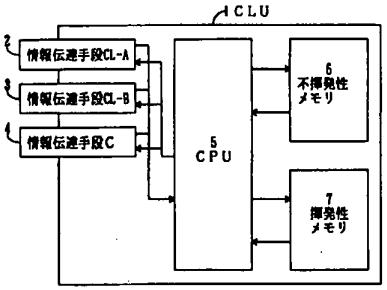
最終頁に続く

(54)【発明の名称】　可搬情報処理装置

(57)【要約】
【課題】　ＲＷＵ、ＣＬＵの開発中においてもＲＷＵとＣＬＵ間の通信を確立し、ＲＷＵ、ＣＬＵのハードウエア、ソフトウエアの検証を行えるようにする。
【解決手段】　少なくともリーダ／ライタ装置との間で電波を介して情報を伝達する手段（２、３、４）を備え、識別情報を送信データの一部として含ませてデータを送信する可搬情報処理装置（１）において、前記識別情報として固定の識別情報を送出する機能を有するようにしたものである。



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【特許請求の範囲】
【請求項１】　少なくともリーダ／ライタ装置との間で電波を介して情報を伝達する手段を備え、識別情報を送信データの一部として含ませてデータを送信する可搬情報処理装置において、前記識別情報として固定の識別情報を送出する機能を有していることを特徴とする可搬情報処理装置。
【請求項２】　少なくともリーダ／ライタ装置との間で電波を介して情報を伝達する手段を備え、識別情報を送信データの一部として含ませてデータを送信する可搬情報処理装置において、リーダ／ライタ装置から返送される識別情報と送出した識別情報とを比較しない動作モードが設定可能であることを特徴とする可搬情報処理装置。
【請求項３】　少なくともリーダ／ライタ装置との間で電波を介して情報を伝達する手段を備え、識別情報を送信データの一部として含ませてデータを送信する可搬情報処理装置において、伝送エラー検知用のチェックコードの整合性を確認しない動作モードが設定可能であることを特徴とする可搬情報処理装置。
【請求項４】　少なくともリーダ／ライタ装置との間で電波を介して情報を伝達する手段を備え、識別情報を送信データの一部として含ませてデータを送信する可搬情報処理装置において、認証コードの一致／不一致の確認をしない動作モードが設定可能であることを特徴とする可搬情報処理装置。
【請求項５】　伝送エラー検知用のチェックコードの整合性を確認しない動作モードが設定可能であることを特徴とする請求項１、２、４いずれか記載の可搬情報処理装置。
【請求項６】　認証コードの一致／不一致の確認をしない動作モードが設定可能である請求項１乃至３のいずれか記載の可搬情報処理装置。
【請求項７】　伝送エラー検知用のチェックコードの整合性を確認しない動作モード、及び認証コードの一致／不一致の確認をしない動作モードが設定可能である請求項１または２記載の可搬情報処理装置。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は電磁誘導現象を利用して活性化し、その後の動作および読み取り／書き込み装置との情報交換も電波を利用して行えるＩＣカード等の可搬情報処理装置に関する。
【０００２】
【従来の技術】従来、読み取り／書き込み装置（リーダ／ライタユニット：ＲＷＵ）側から送信される電波により非接触可搬情報処理装置（コンタクトレスユニット：ＣＬＵ）を活性化し、情報交換を電波を利用して行うものが提案されている。図６（ａ）はＲＷＵからの搬送波が届く範囲にＣＬＵが１つある場合を示し、図６（ｂ）

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はＲＷＵからの搬送波が届く範囲に複数のＣＬＵ（ＣＬＵ１、ＣＬＵ２）が存在する場合を示している。このように、ＲＷＵとＣＬＵとの情報交換を電波を利用して行う場合、ＲＷＵからの搬送波が届く範囲に複数のＣＬＵが存在することを想定して、ＲＷＵとＣＬＵの間でＣＬＵを特定する個別情報（ＣＩＤ：Chip ID）の交換がなされる。ＣＩＤはＣＬＵの製造番号を基にした値であったり、その都度発生させる乱数であったりする。
【０００３】ＣＬＵはＣＩＤを送信データの一部としてＲＷＵに送り、ＲＷＵはＣＩＤを送信データの一部としてＣＬＵに送り返す。ＣＬＵは送り返されたＣＩＤが自分自身のＣＩＤと一致した場合のみ通信を続ける。お互いの送受信データには、伝送エラーを検知するためのチェックコードが付加されており、ＣＬＵでは受信データとチェックコードが一致した場合のみ処理を続け、不一致の場合は無応答となり、次の受信を待つようにしている。
【０００４】伝送データに付加するチェックコードの例（データフォーマットの例）を図７により説明する。図７（ａ）は数バイトのデータを一塊とし、これを計算範囲としてブロックチェックするコード（ＢＣＣ）を付加した例を示し、図７（ｂ）はデータのバイト単位でパリティチェックを行うビット（ＣＣ）を付加した例を示し、図７（ｃ）はデータのバイト単位でパリティチェックを行うビット（ＣＣ）を付加するとともに、数バイトのデータを１ブロックとして、これを計算範囲としてブロックチェックするコード（ＢＣＣ）を付加し、さらにＢＣＣのパリティチェックを行うビット（ＣＣ）を付加した例を示している。このようなチェックコードを付加し、ＣＬＵでは受信データとチェックコードが一致したか否かにより、処理を続けるか、無応答になるかしている。
【０００５】次に、図８～図１０により、ＲＷＵに対してＣＬＵが１つの場合と２つの場合の従来の通信例について説明する。なお、図において伝送方向とはＲＷＵ、ＣＬＵのどちらからデータを送信しているかを矢印で示したものである。図８はＲＷＵに対してＣＬＵが１つの場合で、正常に通信が行われている例を示している。ＲＷＵから呼出しコマンドを送信し（ステップ１－１）、ＣＬＵが電波範囲外にある（ステップ１－２）ために、再度ＲＷＵから呼出しコマンドを送信する（ステップ１－３）。ＣＬＵからはデータの一部としてＣＩＤを送信して応答し（ステップ１－４）、これに対してＲＷＵはＣＩＤを送信データの一部としてＣＬＵに送り返している（ステップ１－５）。ＣＬＵは送り返されたＣＩＤが自分自身のＣＩＤと一致しているので応答し（ステップ１－６）、以後通信を続ける（ステップ１－７）。この例は、ＣＩＤが固定のデータパターンのような場合で、ＲＷＵが固定のデータパターンを持っているような場合である。

【0006】図9はRWUに対してCLUが1つの場合で、正常に通信が行われていない例を示している。RWUから呼出しコマンドを送信し（ステップ2－1）、CLUが電波範囲外にある（ステップ2－2）ために、再度RWUから呼出しコマンドを送信する（ステップ2－3）。CLUからはデータの一部としてCIDを送信して応答し（ステップ2－4）、これに対してRWUは異なるCIDを送信データの一部としてCLUに送り返している（ステップ2－5）。CLUは送り返されたCIDが自分自身のCIDと一致していないので無応答になる（ステップ2－6）。この例は、CLUが乱数に基づいてCIDを生成し、RWUがまだ開発中などのため固定のデータパターンしか持っていないような場合であり、CLUから送信されたCIDをRWUから送信できないため、これを受信したCLUは無応答になり、そのため、RWUはCLUがどのような状況にあるのか把握できない。

【0007】図10はRWUに対してCLUが2つの場合の通信例を示している。RWUから呼出しコマンドを送信し（ステップ3－1）、CLUが電波範囲外にある（ステップ3－2）ために、再度RWUから呼出しコマンドを送信する（ステップ3－3）。これに対してCLU1とCLU2から、それぞれデータの一部としてCID1、CID2を送信して応答する（ステップ3－4）。複数のCLUが応答したため、RWUはCLU識別コマンドを送信する（ステップ3－5）。この識別コマンドは複数の時間区分を指定してどこかのタイミングで応答するように促すコマンドであり、この例では、まずCLU1が応答してデータの一部としてCID1を送信し、CLU2は無応答である（ステップ3－6）。さらにRWUからCLU識別コマンドを送信し（ステップ3－7）、CLU1は既に応答しているので無応答、CLU2が応答してデータの一部としてCID2を送信する（ステップ3－8）。これに対してRWUからCID2を含むカード選択コマンドを送信し（ステップ3－9）、CLU1は無応答、CLU2が応答しており（ステップ3－10）、以後通信が続けられる（ステップ3－11）。この例ではRWUが高機能であり、CLUから乱数に基づいて発生させたCIDと同じCIDを返送する能力を有している例である。

【0008】
【発明が解決しようとする課題】RWUとCLUとの情報交換を電波を利用して行うような場合には、本来、CLUのCIDは他のCLUのものと異なる値であるのが理想である。しかし、RWU、CLUが開発中で、CLUの送信したデータの一部（ここではCID）をRWUからの送信データの一部として埋め込んで、改めてCLUに送り返すといった、動的な動作ができない状況、或いはデータの伝送エラーを検知するためのチェックコードも動的に計算できない状況では、RWUとCLUの通信を続けることができず、RWU、CLUの開発、ソフトウエアの動作確認等に支障きたすことになる。

【0009】本発明は上記課題を解決するためのもので、RWU、CLUの開発中においても、RWUとCLU間の通信を確立し、RWU、CLUのハードウエア、ソフトウエアの検証をスムーズに行えるようにすることを目的とする。

【0010】
【課題を解決するための手段】本発明は、少なくともリーダ／ライタ装置との間で電波を介して情報を伝達する手段を備え、識別情報を送信データの一部として含ませてデータを送信する可搬情報処理装置において、前記識別情報として固定の識別情報を送出する機能を有すること、リーダ／ライタ装置から返送される識別情報と送出した識別情報とを比較しない動作モード、伝送エラー検知用のチェックコードの整合性を確認しない動作モード、認証コードの一致／不一致の確認をしない動作モードがそれぞれが設定可能であることを特徴とする。

【0011】
【発明の実施の形態】以下、本発明の実施の形態について説明する。図1は本発明が適用されるCLUの構成例を示す図である。CLU1は、図6に示したようなRWUとの間で情報交換するための情報伝達手段2～4を有している。情報伝達手段2、3は電波を介して情報を伝達する手段で、相互に電波の変調方式が異なっている。情報伝達手段4は接触端子を表しており、接触式の情報伝達を実現する手段である。CPU5は情報伝達手段を介して送信されるRWUからのコマンドを解釈して実行（例えば、リード／ライト）し、RWUへの応答を行う演算装置である。不揮発性メモリ6は制御情報、ソフトウエア等のデータが格納される記憶装置である。揮発性メモリ7はCPUが演算を行う際の作業領域を提供する記憶装置である。

【0012】図2はCLUのOSが管理する不揮発性メモリの内容の一部を示す図である。本発明のCLU1は、不揮発性メモリ6に固定値CIDが設定され、RWUからの呼出しコマンドを受信すると、設定されている固定値CIDを参照して送出する。RWUはCIDに関する固定のデータパターンを格納しており、CLUから返送された固定値CIDを固定のデータパターンから選択して返送し、その結果両者間での通信が行われる。これ以外にも、RWUからの呼出しコマンドに対して、CLUからはあらかじめ固定的に与えられた値、例えば「00h」や「FFh」などを送出するようにしておくようにしてもよい。なお、固定値CID、或いは固定的に与えられた値をCIDとして使用するか否かのモードは不揮発性メモリに有効／無効フラグを設定することにより行えるようにする。

【0013】なお、CIDを乱数に基づいて発生させたとしても「RWUから返送されたCIDを比較しない」

動作モードを用意しておけば、通信を行うことが可能である。例えば、図2に示すようにCID照合有効／無効フラグを設定し、照合を無効とするフラグをたてるようにする。フラグを有効に設定することにより、CIDを比較するモードとすることができる。また、「伝送エラー検知用のチェックコードの整合性を確認しない」動作モードを用意しておけば、伝送エラーがあっても通信を行うことが可能である。例えば、図2に示すように、伝送エラー確認有効／無効フラグを設定し、照合を無効とするフラグをたてるようにする。フラグを有効に設定することにより、伝送エラーチェックを行うモードとすることができる。また、暗号アルゴリズムを適用した認証コードの一致／不一致の確認においても「一致／不一致を確認しない」動作モードを用意しておけば、認証が成立しなくても通信を行うことが可能である。例えば、図2に示すように、認証確認有効／無効フラグを設定し、照合を無効とするフラグをたてるようにする。フラグを有効に設定することにより、認証確認を行うモードとすることができる。なお、固定値CIDを使用するモード、CIDを比較しない動作モード、伝送エラー検知用のチェックコードの整合性を確認しない動作モード、認証コードの一致／不一致の確認をしないモードは、単独で使用してもよく、或いはこれらのモードの幾つか、或いは全部のモードを組み合わせるようにしてもよい。

【0014】図3はRWUから返送されたCIDを比較しない動作モードに設定した通信例を示している。RWUから呼出しコマンドを送信し（ステップ4－1）、CLUが電波範囲外にある（ステップ4－2）ために、再度RWUから呼出しコマンドを送信する（ステップ4－3）。CLUからはデータの一部として、例えば乱数に基づいて発生させたCIDを送信して応答する（ステップ4－4）。これに対してRWUは異なるCIDを送信データの一部としてCLUに送り返し（ステップ4－5）、このときCLUは送り返されたCIDとの比較を行わずに、一致／不一致は無視して応答し（ステップ4－6）、以後通信を続ける（ステップ4－7）。

【0015】図4はCLUが固定値CIDを送出する通信例を示している。RWUから呼出しコマンドを送信し（ステップ5－1）、CLUが電波範囲外にある（ステップ5－2）ために、再度RWUから呼出しコマンドを送信する（ステップ5－3）。CLUからはデータの一部として固定値CIDを送信して応答する（ステップ5－4）。これに対してRWUはCIDに関する固定のデータパターンを用意しており、この中から送信された固定値CIDと同じCIDを送信データの一部としてCLUに送り返し（ステップ5－5）、CLUは送り返されたCIDとの比較を行い、一致しているので応答し（ステップ5－6）、以後通信を続ける（ステップ5－7）。

【0016】図5は本発明の通信におけるCLUの処理とRWUの処理のフローを示す図である。RWUからコマンドを送信すると（ステップS1）、CLUはこれを受信してコマンドを解釈して実行し（ステップS2、S3）、固定のCIDを送信するモードか否か判断する（ステップS4）。固定のCIDを送信しないモードでは、例えば乱数に基づいて発生させたCIDを含むデータを送信し（ステップS5）、固定のCIDを送信するモードでは固定値CIDを含むデータを送信する（ステップS6）。RWUはCLUからのレスポンスを受信すると（ステップS7）、固定の期待値（RWUが用意しているCIDに関する固定のデータパターン）とレスポンスのCIDとを比較し、一致するときは固定値CIDを含むコマンドを送信する（ステップS9）。不一致のときは不一致時の処理（ステップS10）、例えばエラーを出力する。RWUからの固定値CIDを含むコマンドを受信すると（ステップS11）、CLUはCIDを確認するモードか否か判断し（ステップS12）、確認するモードのときは受信CIDと送信CIDとを比較し（ステップS13）、不一致のときは無応答となる（ステップS14）。ステップS12でCIDを確認しないモードのとき、また、ステップS13で一致したとき、コマンドの処理を行ってレスポンスを送信する（ステップS15、S16）。RWUはCLUからレスポンスを受信すると（ステップS17）、以後、通信を続ける。

【0017】なお、CLUは、通信可能範囲（距離）が問題視されるケースが多く、RWUを微調整しながら、CLUとの通信可能範囲を確保しており、この時、RWUにテストモードのようなものを準備して、簡単な送信テストを実施するようにしてもよい。このテストモードはRWUを組み込んだソフトウエア、ホストコンピュータによる特殊な制御のいずれで行うようにしてもよい。

【0018】
【発明の効果】本発明は、開発中のRWU、CLUにおいて、非接触の変調、復調回路の動作確認が可能になり、また、CLUを製造後、不揮発性メモリ上の設定ビットを変更するだけで、これらの機能を有効／無効にできるため、RWUとCLUの間での通信が確立しやすくなり、RWU及びCLUのハードウエア、ソフトウエアの検証をスムーズにできるようになる。また、RWUにテストモードのようなものを準備しておけば、簡単な送信テストを実施することも可能となる。本発明は、このように、RWUに通信テスト用の機能（低機能）しか提供されていない状態でも、通信を可能にできるため、ソフトウエアの不具合の確認ではなく、ハードウエアの動作を確認する有力な手段を提供することができる。

【図面の簡単な説明】
【図1】 本発明が適用されるCLUの構成例を示す図である。
【図2】 OSが管理する不揮発性メモリの内容の一部を示す図である。

【図３】　ＲＷＵから返送されたＣＩＤを比較しない動作モードに設定した通信例を示す図である。

【図４】　ＣＬＵが固定値ＣＩＤを送出する通信例を示す図である。

【図５】　本発明の通信におけるＣＬＵの処理とＲＷＵの処理のフローを示す図である。

【図６】　ＲＷＵとＣＬＵの情報交換を電波を利用して行う説明図である。

【図７】　伝送データに付加するチェックコードの例を示す図である。

＊【図８】　ＣＬＵが１つで、正常に通信が行われた例を示す図である。

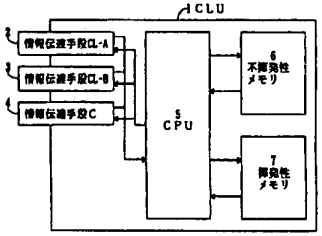
【図９】　ＣＬＵが１つで、正常に通信が行われない例を示す図である。

【図１０】　ＣＬＵが２つの場合の通信例を示す図である。

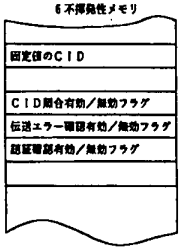
【符号の説明】

１…ＣＬＵ、２、３…電波を介して情報を伝達する手段、４…接触式の情報伝達手段、５…ＣＰＵ、６…不揮発性メモリ、７…揮発性メモリ。

【図１】



【図２】



【図３】

ステップ	RWU	伝送方向	CLU
4-1	呼出しコマンド	⟶	
4-2			電波範囲外
4-3	呼出しコマンド	⟶	
4-4		⟵	応答(CID)
4-5	トード 選択コマンド（異なるCID）	⟶	
4-6		⟵	応答
4-7		┈┈⟶	

【図４】

ステップ	RWU	伝送方向	CLU
5-1	呼出しコマンド	⟶	
5-2			電波範囲外
5-3	呼出しコマンド	⟶	
5-4		⟵	応答(CID固定値)
5-5	トード選択コマンド(CID)	⟶	
5-6		⟵	応答
5-7		┈┈⟶	

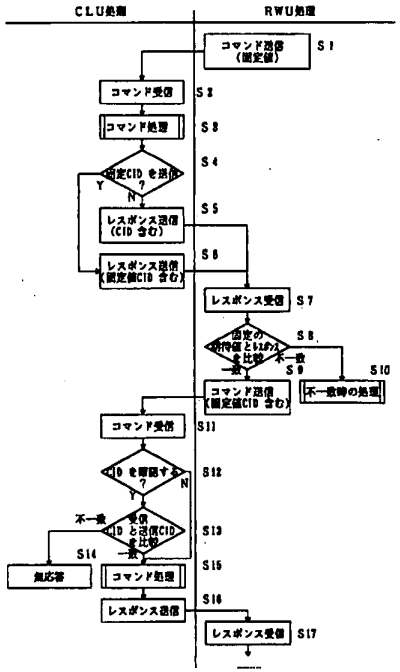
【図８】

ステップ	RWU	伝送方向	CLU
1-1	呼出しコマンド	⟶	
1-2			電波範囲外
1-3	呼出しコマンド	⟶	
1-4		⟵	応答(CID)
1-5	トード 選択コマンド(CID)	⟶	
1-6		⟵	応答
1-7		┈┈⟶	

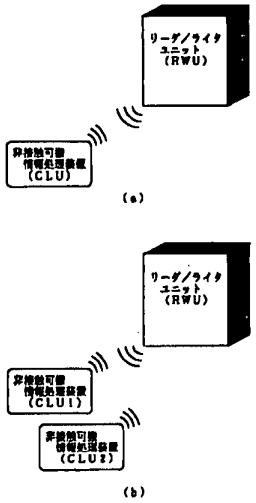
【図９】

ステップ	RWU	伝送方向	CLU
2-1	呼出しコマンド	⟶	
2-2			電波範囲外
2-3	呼出しコマンド	⟶	
2-4		⟵	応答(CID)
2-5	トード 選択コマンド（異なるCID）	⟶	
2-6		⟵	無応答
2-7		┈┈⟶	

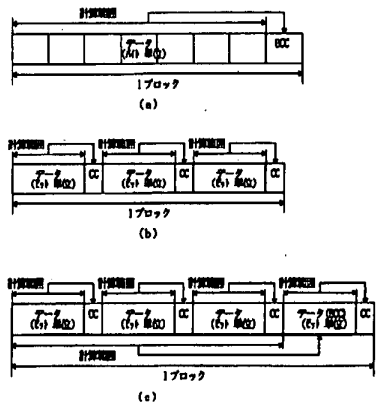
【図５】



【図６】



【図７】



【図１０】

ステップ	RWU	伝送方向	CLU
3-1	呼出しコマンド	⟶	
3-2			電波範囲外
3-3	呼出しコマンド	⟶	
3-4		⟵	応答(CID1, CLU1) 応答(CID2, CLU2)
3-5	CLU 選択コマンド	⟶	
3-6		⟵	応答(CID1, CLU1) 無応答(CLU2)
3-7	CLU 選択コマンド	⟶	
3-8		⟵	無応答(CLU1) 応答(CID2, CLU2)
3-9	トード 選択 コマンド(CID2)	⟶	
3-10		⟵	無応答(CLU1) 応答(CLU2)
3-11		┈┈⟶	

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